**U.S. Geological Survey (USGS) Maryland-Delaware-District of Columbia**
**Monthly Water Conditions Summary**

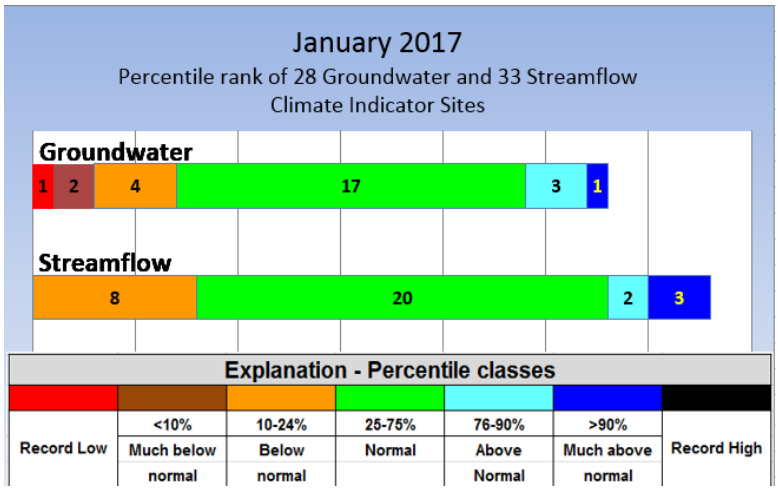
# USGS January 2017 Water Conditions Summary

In Maryland, Delaware, and the District of Columbia, groundwater levels increased between December 2016 and January 2017 at 79 percent of the wells, and streamflows increased at 100 percent of the streamgages used to monitor the response of water resources to changes in weather conditions.

In January, 61 percent (17 of 28 USGS observation wells) of the groundwater levels were in the normal range (25$^{th}$-75$^{th}$ percentiles). Groundwater levels were above normal at 14 percent of the wells, and below normal at 25 percent, with three wells below the 10$^{th}$ percentile and one of them at a record January low, breaking the record set during the drought of 2002.

Monthly mean streamflows were in the normal range at 61 percent (20 of 33 selected USGS streamgages). Streamflow was above normal at 15 percent of the streamgages, and below normal at 24 percent of the streamgages.

Freshwater flows to the Chesapeake Bay were average, and precipitation ranged from above to below average at five Mid-Atlantic weather stations in January. Hydrologic and weather data have not been reviewed and are therefore provisional and subject to revision.




A **percentile** is a value on a scale from 0 to 100 that indicates the percent of a distribution that is equal to or below it. A percentile between 25 and 75 is considered normal. For example, a groundwater level in the 90th percentile is equal to or greater than 90 percent of the values recorded for that month.

## Why is it important for the USGS to collect and analyze water-resources data?

USGS water data are valuable to the public, researchers, water managers, planners, and agricultural users, especially during extreme conditions like floods and droughts. The USGS is known for its consistent measurement techniques and the most extensive set of historical groundwater and streamflow data available to the public. Since these long-term data were collected during wet and dry periods, they can be used to assess how water resources respond to changes in temperature and precipitation, and evaluate how current data compare to the historical data. The uniformity of the dataset enables multi-state comparisons and other comparative statistical analyses that better inform policy makers of possible water-resources conditions they might encounter in the future.

The sites used in this water summary were carefully selected to include long-term data sets, and show the response of streamflow and groundwater levels to weather conditions, rather than the effects of human influences. Of the USGS sites presented in this summary, 13 wells and 29 streamgages have more than 50 years of data. The current streamflow and groundwater data are ranked in comparison to the historical record and summarized. In addition to groundwater and streamflow data, this summary includes precipitation and temperature data, reservoir levels, and freshwater streamflow to the Chesapeake Bay to give a more complete picture of the region's water resources.

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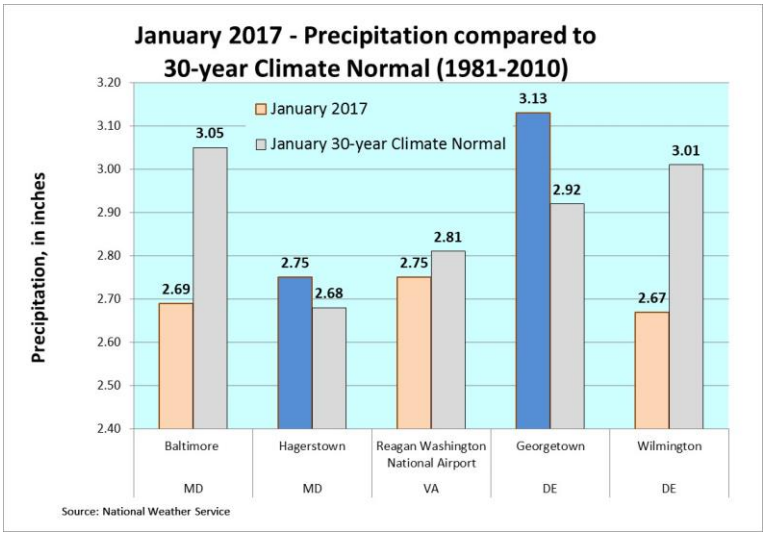
## Weather Conditions

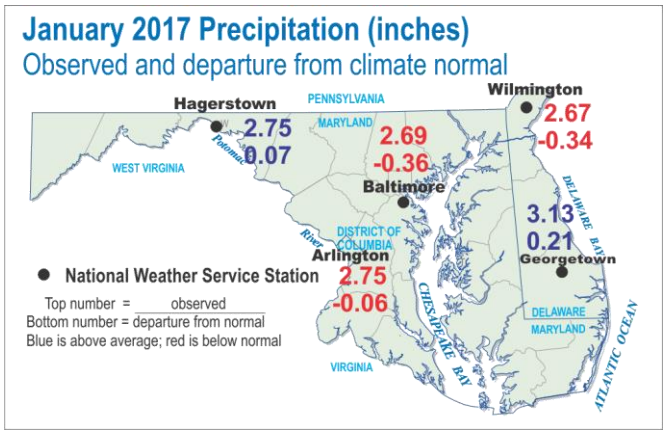
Five Mid-Atlantic National Weather Service (NWS) stations are used to present monthly precipitation and temperature data. The NWS uses averages of data over the 30-year climate normal period between 1981 and 2010. During drought periods, the status from the National Drought Mitigation Center (U.S. Drought Monitor) is included.

### January 2017 Precipitation

January precipitation compared to the precipitation averaged over the 30-year climate normal period (gray bars on graph) was above normal (blue bars on graph) at two Mid-Atlantic NWS weather stations and below normal (tan bars on graph) at three Mid-Atlantic NWS weather stations.




The precipitation map shows the January precipitation and the departure from climate normal as red text for below normal and blue text for above normal. Precipitation was lowest in Wilmington, Delaware with 2.67 inches, which is 0.34 inches less than normal for January.




National Weather Service Stations

**Baltimore** =
Baltimore/Washington International Thurgood Marshall Airport (BWI)
**Georgetown** =
Georgetown, Sussex County Airport
**Hagerstown** =
Hagerstown Regional Airport
**Arlington** =
Ronald Reagan Washington National Airport
**Wilmington** =
New Castle Airport

### Drought Status

According to the U.S. Drought Monitor, as of January 31, 2017, 31.02 percent of Maryland, and 10.58 percent of Delaware were at the moderate drought level (D1). For the most recent drought status, visit: http://droughtmonitor.unl.edu/Home/RegionalDroughtMonitor.aspx?northeast

### January 2017 Temperatures

January temperatures were more than 5 degrees Fahrenheit above average at all five Mid-Atlantic NWS weather stations, with a temperature range from 5.2 degrees to 6.5 degrees Fahrenheit above average. The largest departure from average (for 7 consecutive months) was at the weather station in Hagerstown, Maryland, where the average temperature was 37.3 degrees and 6.5 degrees above the January average.

Source: National Weather Service
MD and DC: http://www.weather.gov/climate/index.php?wfo=lwx
DE: http://www.weather.gov/climate/index.php?wfo=phi:

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# Groundwater

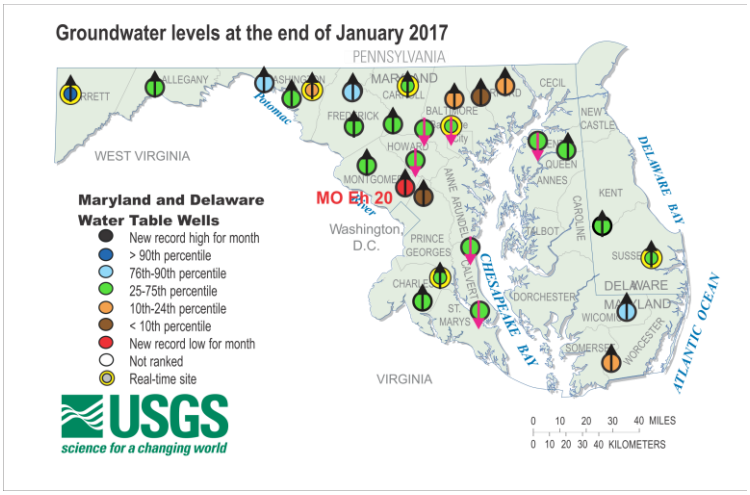
The USGS monitors groundwater levels in surficial or unconfined aquifers, providing observations that can be compared to both short-term and long-term changes in weather conditions. The groundwater wells used for the monthly water summary were selected based on the following criteria:

- Located in a surficial or unconfined (water-table) aquifer
- Open to a single, known hydrogeologic unit/aquifer
- Groundwater hydrograph generally reflects response to weather
- No indicated nearby pumpage, and likely to remain uninfluenced by pumpage or changes related to human activities
- Minimum period of record is 10 years of continuous/monthly records
- Minimally affected by irrigation, canals, drains, pipelines, and other potential sources of artificial recharge
- Well has a casing – dug wells are generally not used
- Water levels show no apparent hydrologic connection to nearby streams
- Well rarely goes dry
- Long-term accessibility likely, such as on public land

In the Maryland, Delaware, and the District of Columbia region, it is useful to compare current data to data collected during the historical droughts of 2002 and the 1960s. There are 11 wells that have over 60 years of groundwater data, which allows comparison to both of these drought periods. Of the 28 USGS observation wells used for this summary, 23 have more than 30 years of groundwater data as of 2017.

## January 2017 Groundwater Levels

In January, groundwater levels increased at 22 of 28 wells (79 percent) since December, however, the groundwater levels remain below normal at 7 wells. On the groundwater map, arrows on the well symbol indicate whether the groundwater level increased or decreased over the past month. Sixty-one percent of the groundwater levels were within the normal range. There were seven wells with below normal groundwater levels, and four wells with above normal groundwater levels.




To access the clickable groundwater map, go to:
http://md.water.usgs.gov/groundwater/web_wells/current/water_table/counties/

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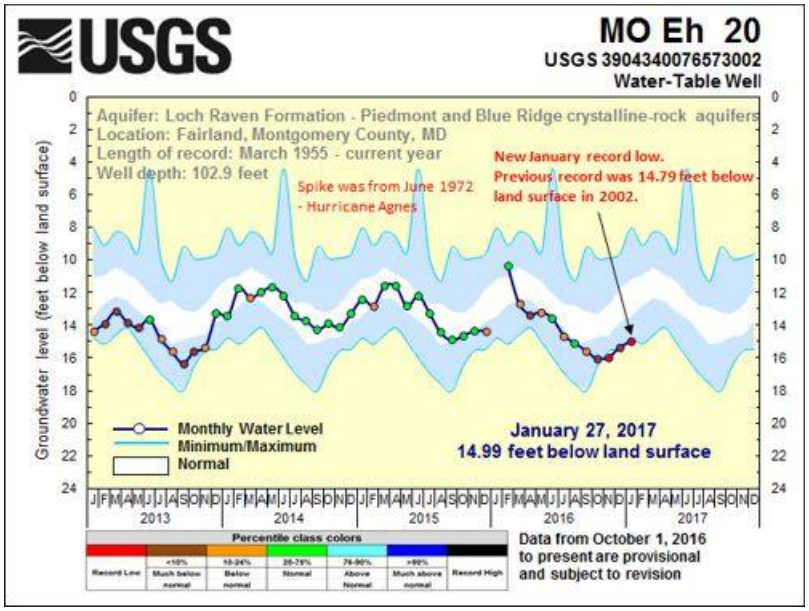
The groundwater level at USGS observation well MO Eh 20, in Montgomery County, Maryland has been below normal for the last 5 consecutive months and most recently was at a record January low at 14.99 feet below land surface.The January 2017 groundwater level exceeded the January record low from 2002 by 0.20 feet. Normal January groundwater levels at this well range from 11.18 to 13.47 feet below land surface.




Five-year groundwater hydrographs can be viewed at:
http://md.water.usgs.gov/groundwater/web_wells/current/water_table/counties

The 5-year hydrograph shows groundwater levels as a dark blue line. Each monthly measurement is colored according to the percentile rank compared to the historical values at the site for the month. The normal range is displayed as a white band, and is based on the period of record. The maximum water level is at the top of the upper blue section, and the minimum water level is at the bottom of the lower blue area in the graph.

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## Streamflow

Streamflow data are used most commonly for assessing water supply and to determine the risk of droughts and floods. Streamflow data are also used to calculate loads of chemical constituents, and to assess how biological communities are affected by hydrologic conditions.

The USGS streamgages chosen for the monthly water summary were selected based on the following criteria:

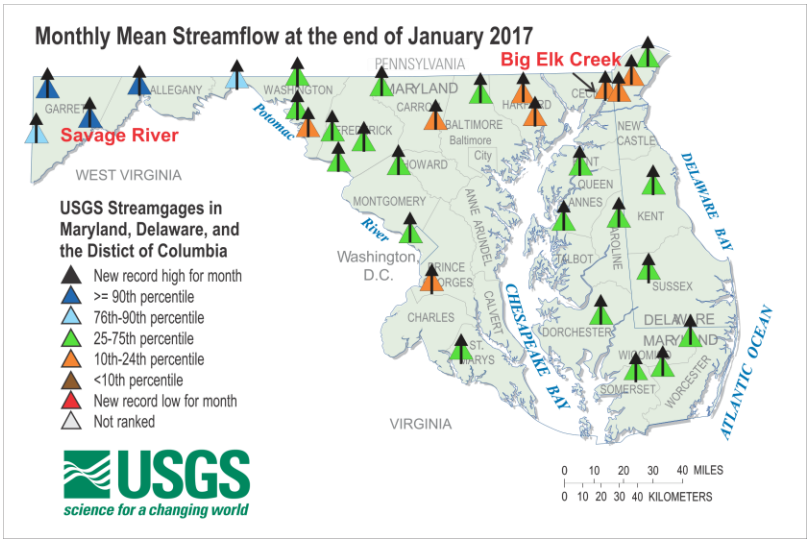
- Minimum period of record is 10 years of continuous data
- Watershed areas greater than 5 square miles
- Streamflow is not regulated, such as by a dam or diversion, and it has relatively natural flow
- Streamflow data reflect a response to weather conditions
- Most of the surrounding area and watershed are not urban

Of the 33 streamgages used in this summary, 22 have more than 60 years of data, allowing for comparison to the historical droughts of 2002 and the 1960s. All 33 streamgages have at least 30 years of monthly mean streamflow data.

### January 2017 Streamflow

In January, streamflow increased since December at 100 percent of the 33 streamgages used to monitor response to weather conditions in Maryland, Delaware, and the District of Columbia. Arrows on the streamgage symbol indicate whether the monthly mean streamflow increased or decreased over the past month.

Monthly mean streamflows were in the normal range (25th-75th percentiles and green on map) at 61 percent or 20 of 33 selected USGS streamgages. Streamflows were below normal at 24 percent or eight streamgages, all of which were between the 10th and 24th percentiles.




Monthly mean streamflow was above normal at five streamgages, with three sites above the 90th percentile.

Due to incomplete streamflow data, likely caused by ice and frozen streams interfering with natural streamflow, estimates were made for eight streamgages (indicated on the corresponding hydrographs – see link below) in January. These data have not been reviewed and are therefore provisional and subject to revision.

To access the clickable streamflow map, go to:
http://md.water.usgs.gov/surfacewater/streamflow/

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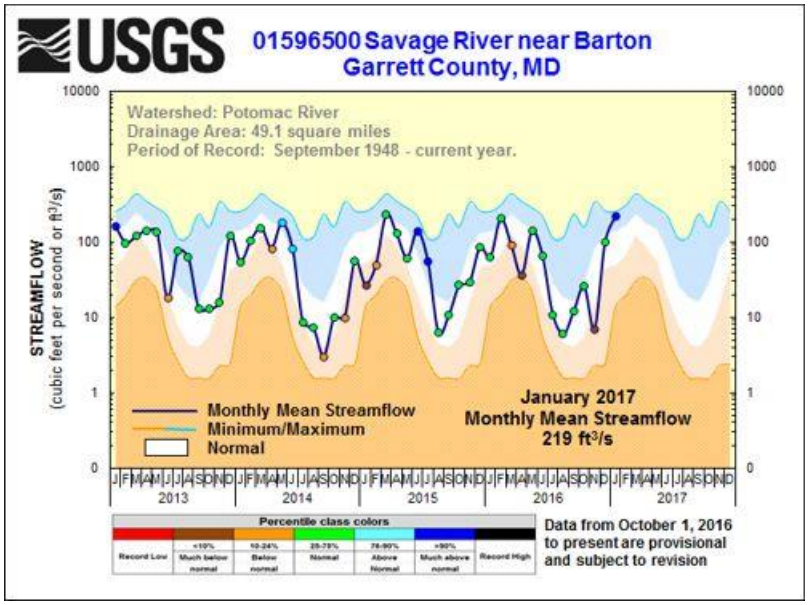
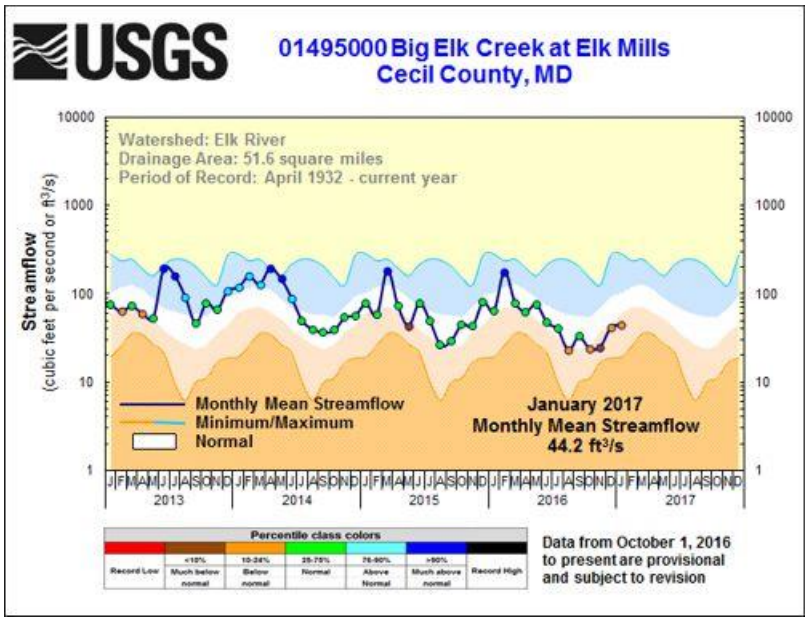
The hydrographs below show the Savage River near Barton in Garrett County, Maryland and Big Elk Creek at Elk Mills in Cecil County, Maryland. At both streamgages, the January monthly mean streamflow increased since December, however, streamflow was above normal at the Savage River streamgage and below normal at the Big Elk Creek streamgage.



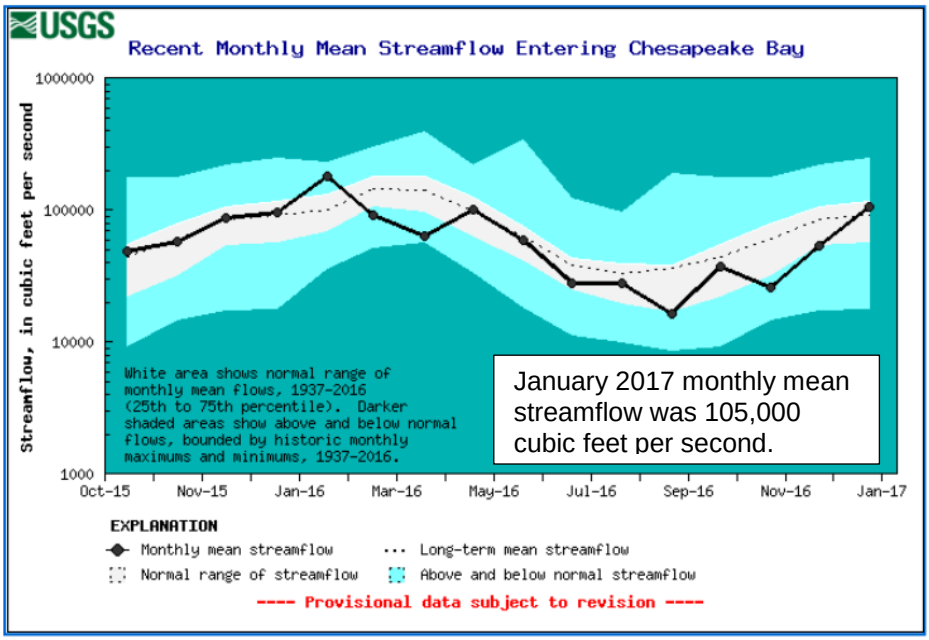




Five-year hydrographs can be viewed at:
http://md.water.usgs.gov/surfacewater/streamflow/

The dark line in the 5-year hydrograph represents the monthly mean streamflow for this period, and the white band shows the normal range ($25^{th}$-$75^{th}$ percentiles) based on the period of record. The maximum monthly mean streamflow is at the top of the blue shaded section, and the lowest monthly mean streamflow is at bottom of the tan area. Each monthly mean measurement (each circle) is colored according to the percentile rank compared to the historical data for the month.

## Estimated Streamflow to the Chesapeake Bay

The estimated monthly mean streamflow entering Chesapeake Bay for January 2017 was 105,000 cubic feet per second ($ft^3/s$). This value, which is provisional and subject to revision, is considered to be in the normal range. Normal January streamflow entering the Bay is between 57,200 and 118,000 $ft^3/s$, the 25th and 75th percentiles, respectively, of all January values. Average (mean) monthly streamflow for January is 91,000 $ft^3/s$. These statistics are based on a 80-year period of record.




Runoff in the Chesapeake Bay watershed carries pollutants, such as nutrients and sediment, to rivers and streams that drain to the Bay. The amount of water flowing into the Chesapeake Bay from its tributaries has a direct impact on how much pollution is in the estuary, and it also affects the salinity levels that are important for the survival of fish, crabs, and oysters, with regard to the location and size of breeding/reproductive zones. Generally, as river flow increases, more nutrient and sediment pollution enters into the Bay.

More information on freshwater flow to the Bay can be found here:
**http://md.water.usgs.gov/waterdata/chesinflow/**

## Baltimore and Patuxent Reservoir Levels

Baltimore City's Department of Public Works provides drinking water from three reservoirs to 1.8 million people daily in Baltimore City and parts of Baltimore, Anne Arundel, Carroll, Harford, and Howard Counties in Maryland. Available reservoir storage at the end of January 2017 in the Baltimore reservoirs (Loch Raven, Liberty, and Prettyboy) was 69.49 billion gallons, or 92 percent of available storage capacity (total or full storage is 75.85 billion gallons of water).

The Triadelphia and Duckett Reservoirs serve 1.8 million residents in parts of Howard, Montgomery, and Prince George's Counties in suburban Maryland around the District of Columbia and are managed by the Washington Suburban Sanitary Commission (WSSC).

The stored water quantity at the end of January 2017 was 5.91 billion gallons, which is 56 percent of normal storage capacity for these reservoirs. Normal storage refers to the volume that is useable for water supply. The full capacity of the Patuxent reservoirs is 12.09 billion gallons, which is higher than normal storage (10.6 billion gallons) and therefore values can exceed 100 percent of normal storage.